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REPORT

ON THE

TRAIL CREEK MINING DISTRICT

BY

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By Authority.
JAMES BAKER,
Minister of Mines.

REPORT

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To the Hon. Col. James Baker,
Minister of Mines, British Columbia.

SIR,—In presenting my report on the Trail Creek Mining District, West Kootenay, I first wish to acknowledge my keen appreciation of the invariable courtesy and assistance tendered me by the mine owners, mine managers, and the other gentlemen connected with this industry, who spared no pains in giving me all access to their properties, and all information relating to the history and conditions of the mines, and the exact amount of the output of ore to date. In this report it will be necessary to go over much ground quite familiar to those conversant with the district, but many of these details may be of service and interest to those outside whose attention has been directed to the fast developing mineral resources of this Province, while it is desirable that as much information as possible be placed on record in the reports of the Bureau of Mines, that may be supplemented from time to time as work steadily progresses, without undue repetition. The work it is proposed to be undertaken by this Bureau is rendered much more difficult by the great area of this Province, and also by the fact that it will be in great part the pioneer endeavour to investigate and record officially the greatly differing conditions that obtain in the many new mining camps that are now being founded. Excellent work has been, and is being, done in the West by the Geological Survey of Canada, but this work is only fairly begun, and it is to be hoped that Dr. Dawson, whose labours have been of such signal value in the West, will be able to extend at once the operations of his Department in British Columbia, especially in this district, as the inestimable value of a thorough geological survey of a country in which ore deposits are to be found has been well established by the results obtained in the Western States of America, where these surveys have proved most useful and beneficial in a strictly practical sense, not only to scientific men, but to the prospectors and explorers who have thus been guided.

Perhaps the greatest factor that will determine the progress of mining and the realization of the wealth that undoubtedly is now locked up in these mountains, is the means of communication and transport. The ores must be carried to the metallurgical centres for treatment, and if the ore deposits now known to exist, and those that may yet be discovered, are to be made available and to become a most valuable part of our resources, trails, roads and railroads must be constructed to make possible the concentration of ores, fuels and supplies at the most favourable points; and if this part of the industry is to be retained in Canada, Canada must assist in boldly advancing these means of communication to make easily accessible the coalfields and the mines from which the different classes of ore can be obtained, that separately are difficult to treat, but brought together and intermixed, can be reduced at minimum smelter charges. Favoured by the trend of the mountains and valleys, American railroads are rapidly entering from the south to transport Kootenay ores to the American smelters; but, notwithstanding much greater difficulties of construction, Canadian roads must be energetically built, and, not only will more mines be opened up, but the large reduction works with the large employment of capital and labour will be mostly retained within this Province. The opening up of Kootenay during the last six or seven years has been rapid, but the most marked advance has followed the building of the various lines of connection already completed, as is seen, for one instance, in the rise of the new camp of Rossland, but more rapid advance is awaiting these better facilities, which it is safe to predict will be called on to carry a heavy tonnage. Several important lines are seeking aid to be built; lines that will open country that already is proving most promising as it is further prospected, and it is hoped that this aid will be granted, so as to permit the immediate commencement of these important undertakings. Not only is the bulk of this ore being shipped to the south, but the large proportion of the fast increasing demand for mine and mercantile supplies is being satisfied by the cities on the other side of the border, with the result that a great revival in their business affairs has followed the opening up of these good markets in British Columbia, greatly due to

the fact that orders can be now more promptly filled and forwarded from this source, this advantage more than counterbalancing the customs duties that are imposed upon imports. Not only this, but much of the mining machinery manufactured in Eastern Canada, and now being extensively ordered, is being brought most of the way over American railroads to the point of entry, Northport. If our own centres of trade are to benefit by this growing business, strong efforts must be made to get these facilities for rapid and prompt delivery which, with customs dues, will more than give Canadian business concerns the advantage, as the fact should be realized that new and large markets are opening up in British Columbia. American business men are making strong efforts to secure this trade, and the current once set in, it will be difficult to deflect it into that channel most beneficial to the commercial interests of this country.

Bulletin No. 2 has been written during a few weeks examination of all the mines and many of the claims yet ranked as prospects, in the immediate vicinity of Rossland. This district has been constantly growing from a small number of claims located on the hill on which the now famous mines are working, until, as work has uncovered a system of parallel veins or leads, in many of which the indications of finding ore are excellent, this area now extends three or four miles east and west of this centre, and one to two miles north and south. To the west, and also to the east across the Columbia River, most favourable reports concerning the discoveries of ore similar to that of Rossland are being made by prospectors and others who have examined these new localities, and, if time will permit, some of these will be visited and described in the Annual Report of the Minister of Mines.

The discovery, during the last two or three years, of large bodies of high grade gold ores, in which dividend-paying mines are now being operated, is attracting the earnest attention of many mining men and capitalists of both America and Europe. The opening up of the large mines at Rossland that, notwithstanding many heavy disadvantages—rapidly being overcome, such as means and cost of transportation—have proved very remunerative, and, as more extensive exploratory work and greater depth are attained, promise permanency of large and profitable ore bodies, is stimulating more thorough prospecting not only around Rossland, but in many other localities in this district, with the result that other camps are quickly coming to the front as good prospects on being worked disclose ore of increasing value.

Many claims at many points in Trail Creek District are now being carefully examined and bonded or bought, which better means of access and egress, now projected or being completed, will render possible their being worked, and the principals or agents representing capital are investigating these new resources. The fact that men interested in the treatment of ores, or their transportation, on studying the conditions and possibilities now shown, have begun large undertakings, or are now planning them, is indicative that the future development of this part of the Province will be soon on an extensive scale, and of their confidence, based on experience, in the extent and value of its mineral wealth.

The concensus of opinion of many mining men who have studied the conditions and surface showings in this new camp at Rossland, is to the effect that few camps have ever shown so many favourable indications that warrant the belief that on further extensive, systematic exploration other shutes of gold ore will be uncovered. Prospecting has disclosed these many parallel veins, varying in width, when exposed, from an inch to several feet, and it is believed that many more ore shutes will be found when these most promising surface indications are thoroughly exploited, for it is quite improbable that the large shutes of rich ore that have been shown on the surface by denudation will be found to be the only ones.

This district has now reached that stage when persistent, plucky development work, sustained by ample capital, must be done to prove up these many veins and surface showings, but a sufficient amount of working capital is demanded, (*a.*) because much of the rock is very hard to mine, necessitating good machinery to make proper progress, (*b.*) considerable or even extensive development work must be done in the search for more pay shutes, (*c.*) while the more or less faulted nature of the ground, though not serious, will complicate this work. While the present mines were opened up with comparatively small capital by reason of the mines producing pay ore shortly after work was begun, or ore that was very profitable as soon as roads were built over which it could be sent to the smelters, still any enterprise that is now undertaken will require strong financial support, and already several powerful companies are at work.

The output from Rossland this year will not show the predicted increase over that of last year for several satisfactory reasons, although there is now, without doubt, much high grade ore in sight. In the first place better and cheaper means of transport for ore are being awaited, as the shipping mines are now in such a position that they can afford to hold back

their shipments for better rates. Again, the smelter at Trail has not until recently been in such working order as to be able to handle anywhere near the amount of ore it is proposed to treat, nor has the tramway yet the proper facilities for carrying away much ore, but both of these, in a short time, should be able to work up to a much greater capacity. In some cases shipments have been suspended on account of the properties being bonded, or until the completion of underground workings that will make mining more advantageous.

The camp is the scene of constantly growing activity. Much good exploring work has been begun, much more is being projected. Already five air compressor plants are installed, and six more are being put in, while larger hoisting engines and pumps have also been bought, most of this machinery being of Canadian make, *i.e.*, the Ingersoll-Sargeant Drill Co., Montreal, the Rand Drill Co., Sherbrooke, Quebec, and the Jenckes Machine Co., of the same place. Altogether, $175,000 worth of machinery and supplies have been ordered for this camp.

Production.

Total No. of tons smelted to July 1st, 1896		27,085
do.	" ounces of gold	45,234
do.	" " silver	67,793
do.	" lbs. of copper	1,265,362
do.	gross value recovered by smelters	$1,007,007

Average net values per ton—gold, 1.67 oz.; silver, 2.5 oz.; copper, 2.3 %. Value, $37.18.

In the above returns the compilation was made directly from the shipping returns and books most kindly produced for inspection by the officers of the following mines that have shipped ore other than test lots:—The Le Roi, War Eagle, Iron Mask, Poorman, Josie, Cliff, and Evening Star, and the above results give almost the exact output of the mines at Rossland up to July 1st, 1896. The tonnage is the net, or with moisture deducted amounting to ½ to 1 per cent. The amount of gold and silver given is the actual amount allowed for by the smelters, or 95 to 98 per cent. of the assay value of the gold contents, and 95 per cent. of the silver. The percentage of copper given is the assay value less 1.3, as in the general average value the copper assay would indicate 3.6 per cent. of copper in the ore. The gross value includes smelter and freight charges. The output from the free-milling ores of the O. K. mine could not be obtained in time for this bulletin.

Total amount of dividends paid to July 1st, 1896	$332,500
Le Roi	$175,000
War Eagle	157,500

Location.

The Trail Creek mining district is located in the southern part of West Kootenay, on both sides of the Columbia River, and along the International Boundary Line between Canada and the United States.

Rossland,

The chief mining centre, has grown very rapidly to a town of about 4,000 people, and is supplied with good hotels, two banks—the Bank of Montreal and the Bank of British North America—churches, stores, a water-works system, electric light plant, three newspaper offices, post office, express office, etc , and is noted for the orderliness maintained by the Government officer, Mr. John Kirkup, and his subordinates, many of the chief elements of disorder usually found in a new mining camp being vigorously suppressed. The town is about six miles west of the Columbia River, on the north slope of the valley down which runs Trail Creek to the Columbia, at which junction is the town of Trail, and close to its northern boundary are the principal mines on the slopes that lead up to Red Mountain, Monte Cristo Mountain, and the Columbia-and-Kootenay Mountain, that rise gradually from 800 to 1,800 feet above the town; to the south is Lake Mountain, which, with Look-Out Mountain near Trail, comprises the South Belt, and to the west is Deer Park Mountain. One mile and a quarter to the west is a small stream, the east fork of Sheep Creek, flowing southerly and joining the Columbia at Little Dalles beyond the boundary line about four miles distant.

Communication and Transportation.

Four years ago only trails led into this part, the Dewdney trail having been built in 1865, but now a waggon road runs to Trail and another down the fork of Sheep Creek to Northport, in the State of Washington, over which much ore has been and is shipped in heavy ore waggons, which return with much of the supplies for the town and the mines. Already three lines of railroad are surveyed to this town, one of which is built and another is building, while it is reported that one of the great American roads in the north is looking for a line of entrance. Of the three lines surveyed, one, (*a*) the Columbia and Western Railroad, has built a narrow gauge line, locally known as the "tramway," easily alterable to standard gauge, down Trail Creek to Trail, to carry ores to the Trail smelter or elsewhere, and connection is made with the excellent steamers of the Columbia and Kootenay Navigation Company, that run north 130 miles, connecting with the main trans-continental line of the Canadian Pacific Railroad at Revelstoke, or at Arrowhead, and the railroads at Robson and Nakusp, that run to Nelson and the Slocan respectively, and to the south to Lytton and Northport, 25 miles. This C. & W. R. R., running 11¼ miles to overcome the difference in elevation between Trail and Rossland, of about 2,100 feet, using several switch-backs, is now being located westward to the Boundary District and thence on to Penticton on Okanagan Lake.

(*b.*) The Canadian Pacific Railroad has a line surveyed in from Robson, which is expected will be constructed as soon as possible, and extended west to tap the main line, and eastward to the main line, passing by the way of the Crow's Nest Pass, where are located the great deposits of coal that will yet become a strong factor in the smelting propositions of the Province. (*c.*) The Spokane Falls and Northern Railroad, also known as the Red Mountain Railroad, President, D. C. Corbin, now being built from Northport up the east fork of Sheep Creek, will pass, as does the tramway, in close proximity to many of the leading mines, and will connect at Spokane with the two trunk lines, the Northern Pacific Railroad and the Great Northern Railroad, whence is direct communication with all parts of the United States, as well as easy access to the smelters on Puget Sound, at Tacoma and Everett, to those at Helena and Great Falls, Montana, and to the smelters farther south in Colorado and at Kansas City. Hence the fast developing scheme of transportation will soon change the conditions of this district by giving cheaper and quicker egress for the production of the mines, or for the assembling at the most favourable points at the smelting or other reduction works, the different kinds and grades of ores, the fuels, fluxes and other supplies that should make possible the much cheaper handling and treatment of the various ores now known to exist in large quantities.

Although much ore of high grade is being mined, large bodies of low grade, averaging $4 to $12 in gold, 1 to 3 ounces in s. and up to 3 per cent. copper, are now exposed, and further necessary systematic and fearless development work must be done, which this widening range of transport facilities will aid most materially not only in handling the output of this one camp, but in collecting at the best points different classes of ores from the newer localities now being prospected, as well as the camps already established elsewhere in this part of the Province. The restriction to the more or less same class of ore, unless it be of a most favourable character, seldom got or maintained, is generally not at all conducive to the best smelting practice, and the localizing of the smelting industry of the Province at the most advantageous centres where will be collected the different ores from different parts that are so necessary for the most economical treatment, one kind of ore helping to flux the others, will be greatly determined by the shipping facilities by waggon road, railroad or steamboat, that are now being supplied or projected. As the future of the mining business in Rossland and the surrounding districts will be largely dependent upon the cheapest treatment of the ores produced, and we can now announce the erection in the near future of very extensive smelting plants in the Province, communication assumes vital importance, and now it is almost promised that it will be rapidly extended as the ore bodies are found to be persistent and profitable throughout more than a limited area.

The mountains in this Trail Creek region are for the most part rounded and covered with timber, not very high and not precipitous, so that a waggon road can usually be built anywhere without much difficulty, while a railroad can be put through any of the different valleys with switch-backs if needs be, so that nearly any mine will not be difficult of access. The supply of timber for fuel and mining purposes on most of the claims will soon be exhausted, but much can be brought in cheaply by the railroads when the need comes. The supply of water is also small, but so far adequate for mining purposes, and a large supply cannot be got less than 6 miles distant.

Early History.

Early in the sixties the placer mines on Wild Horse, Findlay, and other creeks in East Kootenay, having been discovered, resulting in the rush there of miners, and the constant demand for supplies, as there was no means of communication between the coast and this district, except through the United States, with vexatious delays at the Customs, Mr. E. Dewdney, now the Hon. the Lieutenant-Governor of British Columbia, was instructed to survey and construct a trail entirely within British territory, through the southern part of the Province, as a passage to the north had been proved to be not feasible. In 1865 this trail, since known as the Dewdney Trail, was finished, and in its course it passed about one mile south of the present town of Rossland on its way down Trail Creek to the Columbia River. Hence a means of ingress was given to this region, and indications show that early prospectors were attracted to the iron-stained cappings that have now attained such importance and value, as a 5-foot hole on the Le Roi, and other openings testify, but the low grade surface rock discouraged them, while the means of getting such ore to smelting centres seemed quite out of reach. However, in 1889, Joseph Bourjouis located the first claim, the Lily May, near the Dewdney Trail, which in 1890 was recorded by J. Bordau. In this year J. Bourjouis located the Centre Star and the War Eagle, while the Virginia and Idaho were staked by J. Morris, his partner. They also discovered the Le Roi but forbidden by law to stake more than one claim on the same vein, this piece of ground became the property of Mr. E. S. Topping by his simply paying the expense of recording.

In November, 1890, Mr. Topping met at Colville two Spokane attorneys, Mr. George Foster and Col. Wm. Redpath, showed them samples of Le Roi ore, and offered to sell one-half interest in the claim for $30,000. These gentlemen became interested in this property, went to Mr. Oliver Durant, a gentleman of long mining experience in the west, in whose judgment they had full confidence, and he, also impressed with the ore, finally secured a working bond on $\frac{16}{30}$ of the property for 6 months, with the proviso that during that time he should spend $3,000 on the claim. Although he knew good mining men had condemned the ore deposits of this region as of altogether too low a grade, Mr. Durant came up at once, examined the claim, taking from a shallow cut 16 feet long across solid sulphides careful samples that returned as high as $60 in gold, at the same time visiting the Enterprise, Centre Star, Idaho, Virginia, War Eagle, and Josie. Satisfied with the showings, E. J. Kelly was left in charge of the sinking of a shaft, from which during the winter weekly samples were forwarded, with great difficulty, to Marcus, Wash., by trail down Trail Creek and the Columbia, samples that assayed from traces of gold up to $472. In the spring of 1891, after many vicissitudes, 10 tons of picked, pure sulphide ore from the bottom of the 35-foot shaft, where the vein was fully 9 feet wide, were packed out to the Columbia and shipped to the Colorado smelting works at Butte, when the excellent return of $84.40 per ton was given as the value of the ore, or 3 ounces of silver per ton, 5.21 per cent. copper, and about 4 ounces of gold. The bond was then taken up, and in the course of time the remaining $\frac{14}{30}$ were sold by Mr. Topping to some of the present owners. The Le Roi Gold Mining Company was then formed, and about 70,000 shares of the treasury stock sold at a small figure.

For over a year Mr. Durant had charge of the work, contending with many obstacles, insisting on the continuance of development as he pertinaciously believed in the ultimate conversion of this prospect into a valuable mine, but finally he decided to sell out his interest to the others, and with Mr. A. Tarbet bought the Centre Star and Idaho, upon which nearly 900 feet of work were done at a cost of $25,000, work that was the main support of this little camp. But the need of roads was pressing, no advance could possibly be made, and again through the efforts of Mr. Durant, a trail and then a road were built up the East Fork of Sheep Creek from Northport by the business people of that place, and Captain Fitzstubbs, Gold Commissioner for West Kootenay, ordering the construction of a road up Trail Creek from the Columbia, the conditions of the camp were at once made much more favourable. With the coming of the financial crisis of 1893, Mr. Durant, whose unceasing and determined efforts had overcome many difficulties and disappointments, and demonstrated that the properties he had so faithfully worked at, were good, was forced to suspend operations until 1895, when he resumed work on the Centre Star, now organized into a stock company.

In the winter of 1893-94, the Le Roi that had shut down upon the expenditure of the proceeds from the sale of the treasury stock, was able to ship by sleighs over the Trail Creek road, the ore that had accumulated upon the dump, and this netting a good profit, active mining operations were begun, and the fast increasing ore shipments, as detailed elsewhere, bringing handsome returns to those who had pluckily stuck to this claim, the Le Roi was

fairly launched upon its successful career as a rich dividend paying mine. In the meanwhile, Mr. J. A. Finch and Mr. P. Clark had been attracted to the camp, Mr. Finch getting a bond on the War Eagle, which he relinquished after expending several thousands of dollars prospecting; after which, Mr. Clark, who had thrown up his bond on the Josie, obtained one on the War Eagle. In the work hitherto done on this property, a large shute of low grade pyrrhotite, averaging $14 to $16 in gold to the ton, had been more or less explored, but on going farther west a few hundred feet, by trenching, the top of a splendid body of good ore, averaging 2¼ ounces in gold, nearly 100 feet long and 8 to 12 feet wide, was uncovered, and this mine took its place among the best in the camp, paying shortly afterwards its first dividend, February 1st, 1895, of $32,500.

Another strong factor in the rapid progress of the camp is the connection with it of Mr. Heinze and Mr. D. C. Corbin, President of the Spokane Falls and Northern Railroad. Mr. Heinze, the head of a smelting works in Butte, Montana, sent in two men to go over the ground, with the result, after much negotiating, that he made a contract with the management of the Le Roi mine that they should supply him with 37,500 tons of ore on the dump, which he would pay for after the shipment and sampling of each lot, deducting $11 per ton for freight and treatment charges; and also 37,500 tons on which the charges should be at the lowest rates obtainable in the open market. With this amount of ore contracted for, a land grant from the Provincial Government and a bonus of $1 per ton smelted from the Dominion Government, Mr. Heinze erected the Trail Smelter and built the tramway from the smelter to the mine. Mr. Corbin who has extended his road from Northport to Nelson, supplied also with a Provincial charter and land grant, is pushing his road up Sheep Creek from the south to Rossland. Thus constantly as the conditions improve whereby the cost of mining, shipping and treating the ore are materially lessened, does the limit decrease at which the ore ceases to be profitable and much more of the lower grade ore now in sight is made available.

The Ore Deposits.

Mr. R. G. McConnell, of the Geological Survey of Canada, after a short visit in 1894, reported* the country about Rossland to be "an area of eruptive rock, mostly diorite and uralite porphyrite cut by many dykes," but as no complete geological survey has yet been made, nor any reported lithological study, only a very general description can now be attempted. The main mass of all the country rock is evidently diorite, although it presents many different gradations in composition and structure, varying from a fine grained aphanitic rock with very little horneblende at one extreme to nearly massive horneblende at the other, often showing mica and pyroxene. Much of it looks like a basic syenite and samples have been taken for microscopical examination and later report, but the main point of interest is the fact that these ore bodies or veins traverse the diorite, although cores from the hanging and foot walls of the Le Roi shute will be examined as well as samples from either side of the Centre Star ore shute so well defined in the cliff running up Centre Star Gulch, to ascertain whether these samples are all one class of rock or two. In going over this region the variations are seen to be very marked, in some places the rock being stratified as if of sedimentary origin, but in all probability a more or less altered eruptive. Porphyry dykes from one foot up to 60 and 80 feet wide traverse the country, many with a north and south strike, but with no apparent dislocation of the veins which they cut through; indeed, at six such points of intersection the ore seemed to be concentrated, and even to follow along the dyke for some distance, but this must be made clear by further under-ground work. A careful geological survey will reveal very interesting facts relative to the formation of these ore deposits.

In this Rossland ore, much prospect work has shown clearly that there is a large system of lines of fracture with an east by west and north-east by south-west trend, and a persistent northerly dip, along which more or less ore has concentrated, either as bodies of solid sulphides or sulphides scattered through the country rock. Some of these fissures can apparently be traced through several 1,500-foot claims, and along them are the large ore shutes now being mined or developed, the maximum width of pay ore so far being about 35 feet, and maximum length 310 feet. Many of these fissures have been or are now being prospected, and in many instances with surface indications of the most unfavourable character, the improvement has been very marked in the increase of the amount of ore and its value, and the great probability that more rich ore shutes will be found by following these fissures has made all such property valuable, and is deciding the commencement of extensive exploratory work. Again, large shutes of low grade ore, mostly the coarse grained magnetic iron pyrites or pyrrhotite, assaying from traces to $6 to $8 in gold, have been found and are being explored for better grade

*Summary reports of the Geological Survey of Canada for 1894, 1895.

ore and so far with some success, but development, except on a few claims, has hardly yet begun and so far only the shutes that have been exposed at the surface are being worked, and it is yet impossible to foretell how much extensive underground mining will be rewarded. Further details as to the ore bodies will be given in the description below of some of the mines.

The surface of these ore shutes is covered with the typical iron capping, or reddish brown sintery mass, and experience enables the prospector to distinguish between disintegrating sulphides, and barren diorite heavily iron stained by the oxidizing of the bisilicates or the iron pyrites nearly always present in this rock. Although it is difficult to prospect such rock which may be much iron stained but with no vein whatever in the vicinity, nearly all work is done along one wall and the ore appears to follow along one wall, where the rock is not too full of fissures that disguise true conditions, but it is doubtful if more than one wall ever really exists, although a parallelism of lines of fracture may for a short distance seem to prove the contrary. Wherever the ore is found to consist almost of pure sulphides, it will be found lying along and parallel to such a wall, after which ore is disseminated more or less through the inclosing rock, often following along small fissures that in some cases form small veins of good ore that run for a considerable distance away from the main deposit. In all the mines the ground is faulted, thus dislocating the ore deposits and stringers and complicating the search; but these slips will be better understood as work progresses, although much development work will have to be done by driving steadily ahead along the general course of the veins and cross-cutting, for the good rule of following the ore is seldom possible for any distance by reason of these dislocations.

The Ores.

The ores at Rossland, with the exceptional free-milling gold quartz of the O. K. mine, may be divided into three classes :—

(*a.*) Those large deposits of coarse-grained massive pyrrhotite, locally known as the "iron ore," in which very little or no value in gold is carried.

(*b.*) The ore found in many claims on the south belt, as the Lily May, Homestake, Mayflower, Curlew, Gopher, R. E. Lee, etc., in which the sulphides are not pyrrhotite but iron pyrites and marcasite (white iron), with in some of these mines much arsenopyrite, and also zinc blende and even galena, in which case the silver value exceeds the gold, and the percentage of copper is very small or nothing.

(*c.*) The typical ore of the camp as sold by the Le Roi, War Eagle, Iron Mask, or Josie, is divided into first-class and second-class. The first-class consists of nearly massive fine grained pyrrhotite and copper pyrites, sometimes with a little magnetite, or mispickel, with more or less quartz and calcite. In this class of ore, as got from the lowest workings of the Le Roi, the amount of quartz is much higher, the smelter returns giving 41 to 52.8 % silica, and 20.6 to 26.8 % FeO., but this is proving the best ore in the mine, the average smelter returns were on 1,200 tons, 2.6 oz. of gold, 1.8 oz of silver, and 2.5 % of copper, or $53.05* net, per ton, while some shipments went as high as 4.06 oz. in gold.

The second-class ore, and the bulk of the ore of the camp shipped, will be most probably of this character and value, is a diorite with a comparatively small percentage of these sulphides, but the value is still very good; 1,800 tons of the Le Roi, second class, yielded by smelter returns, an average of 1.34 oz. of gold, 1.4 oz. of silver, and 1.6 % copper, or $27.97* net, per ton. Mr. Bellinger, of the Trail Smelter, kindly gave the average analysis of this ore to be FeO. 22 %, SiO_2 42.5 %, CaO. 7. %, MgO. 3. %, Al_2O_3 18. %; copper, 1.5 %, S. 6 %.

Treatment.

The destiny of the mining operations of this part of the Province will depend, to a very great extent, upon the means of transportation, and then upon the cost of metallurgical treatment, for a large amount of low grade ore is promised, and the possibility of treating such ores at a low figure to leave a fair margin of profit must attract the best endeavours of the metallurgist. The ores containing a high percentage of sulphides will be very desirable, and should command the lowest smelting charges, but in all probability the great bulk of the Trail Creek ores will be of the mixed class, or diorite with a comparatively small proportion of sulphides, and hence a low percentage of copper, while again the amount of arsenic, abundant in some of the ore, will be an important element. This ore has now been shipped to many of the American smelters, such as at Tacoma and Everett, Washington, and Great Falls, West Helena, and Butte, Montana, and now much will be smelted at the new works

* Not deducting freight and treatment charges.

at Trail, to be described. The erection of smelters at Rossland in the immediate vicinity of the mines, is being seriously contemplated, but it is yet too early to make any definite statement. The cost of freight and treatment is now about $10 to $14 per ton, when 95 per cent. of the assay value of the gold and silver is paid for, and 1.3 is deducted from the percentage of copper present.

Of course the possibility of other processes being suitable to such ores is being tested, such as the cyanide and chlorination processes, and the results will be awaited with much interest as some such process may prove very successful, and all judgments should be deferred until the conclusive experiments have been completed.

The British Columbia Smelting and Refining Company.

The officers of this smelter, which is located at Trail Creek, B.C., are:—President, F. A. Heinze; Commercial Manager, J. F. Lansing; Superintendent, E. H. Wedekind; General Superintendent of Mr. Heinze's Smelters at Butte and Trail, H. C. Bellinger. On securing the large contracts for ore from the Le Roi mines, Mr. Heinze secured the present excellent smelter site, on the bluff overlooking the Columbia, at the mouth of Trail Creek where has sprung up the town of Trail. This smelter has been erected with great rapidity in spite of inclement winter weather and great difficulty in securing supplies of building material and importing the plant and machinery; but although work was begun October 10th, 1895, the first furnace was fired up in February, 1896, and now five furnaces are in full operation, with further extensive and important additions being rapidly pushed to completion, additions that should greatly improve present conditions and treble the capacity of the works. Beside that with the Le Roi, contracts have been made with the War Eagle, Iron Mask and Crown Point. Mr. Heinze and his associates are proving their ability for prompt decisive action, not only in the construction of their smelting works and the tramway, but in the inception and inauguration of other extensive enterprises that mean much for the improvement and advance of the mining operations of this district.

As was to be expected the ores from this new camp have offered at first some considerable difficulty in treatment, especially as the class of ore now mined is much more siliceous, and contains less copper than the earlier tests indicated, but now every furnace is working with much less trouble and up to their capacity, especially since the floods have subsided permitting the more regular supply of coal, and the smelter is now the scene of activity where, ten months ago, were only the sand bluffs of the Columbia.

The smelter now comprises:—

The Sampling Mill, daily capacity, 150 to 200 tons; bin capacity in the mill, 750 tons. The ore passing through a 12x22 inch Blake crusher, is run through a trommel, whence the fines go to a Constant cylindrical sampler, and the over-size to a 9x15 crusher and rolls, and then to the sampler and into the bins, until the lot of ore is settled, from whence it goes to the calciners or the bins from which it can be drawn in cars to the blast furnace. This sampler is inadequate for the amount of ore offered, and is now being enlarged so as to handle 350 to 400 tons per 24 hours.

In the *Roast House* is one O'Hara automatic calcining furnace, with foundations laid for a second. This furnace is 120 feet long over all, and has two 90-foot hearths, one above the other, 9 feet wide. One travelling chain passes along the centre of the hearths, carrying 6 plows and 6 trolleys or chain carriages, at the rate of about 25 to 35 feet per minute, and as yet very little repairs have been required, the chain, plows, and trolleys showing but little sign of corrosion in the furnace. Fifty tons of ore crushed to pass a half-inch ring are roasted per day, with a loss of 70 per cent. of sulphur contents, the ore taking 12 to 14 hours to pass throuph the furnaces in which ten fire places fired with wood supply the heat. Besides this furnace, there are in the furnace-room six circular calciners, such as used in Butte, placed above the reverberatories, the ore automatically fed, passing over 6 horizontal revolving hearths that discharge alternately from the rim and centre upon the lower one, thence into the hoppers below that are immediately over the hearth of the reverberatory. It is designed in this furnace that when once ignited no further fuel will be needed than the sulphur, but they must run continuously, and on account of irregularity, until recently, in the operation of the reverberatories, these calciners have not been used.

The dust chamber is 180 feet long, 10x12 feet inside, with wing walls from the sides every 10 feet, not over-lapping, but having a clear space through the chambers to the chimney, which is 140 feet high and 8½ feet square inside.

Furnace Room, 60x310 feet, 68 feet to peak of roof. The ore is being smelted after two methods:—(*a.*) In four reverberatories, hearths 14x22 feet, 40 tons each per 24 hours, in

charges of roasted and unroasted ore, slag and limestone, are now being treated. The fuel is wood, but as this is not yet dry enough to give the required heat, coal also is being used, over 70 tons a day, from the Anthracite Coal Co.'s mines, on the eastern limits of the Rocky Mountains, whence it is brought over the Canadian Pacific Railroad to Revelstoke, or Arrowhead, and thence in scows down the Arrow Lakes and the Columbia to the smelter, whence it is raised up an incline 160 feet by a small steam hoist with cable and car, to a trestle along which the car can be run to the shutes wherever needed in the works.

(*b.*) In a 40-inch circular furnace, 12 feet high to feed floor, water-jacketed, with six 3-inch tuyeres, also with fore-hearth, 45 to 55 tons of raw ore are now smelted in 24 hours. As the amount of sulphur in these ores is low, and that in the pyrrhotite not available for fuel, as already it is a natural matte, a typical form of pyritic smelting cannot be used, but more or less fuel is necessary, and a very satisfactory grade of coke is got from Fairhaven, Washington, although it carries from 20 to 24 per cent. ash. A small amount of limestone is added to the charge, but at present a very acidic slag, rather thick, but giving a good separation, is flowing, but very careful handling of the furnace is imperative. The analysis of this slag gives, SiO_2, 42 to 46 %; FeO., 12 to 19 %; Al_2O_3, 14 to 19 %; and MgO. 4 to 6 %.

A new 200-ton rectangular blast furnace, made by E. P. Allis & Co., Milwaukee, Wis., after a composite design by Mr. Bellinger and Mr. Wedekind, is being quickly erected. In this furnace, 120x38 inches at the tuyeres, the steel water-jackets will be 5½ feet high; height to feed door, 14 feet, with 24 6-inch tuyeres with thimbles of smaller size that can easily be put in for the purpose of experimenting with the quantity and pressure of blast, for all arrangements are to be such that tests can be made under varying conditions, to determine the greatest possible efficiency for this furnace upon this class of ore. Another feature of this furnace will be that, besides the movable fore-hearth, the bottom or crucible of the furnace will also be mounted, so that if required it can be altogether withdrawn from beneath the water-jackets.

The bluff on which the smelter stands is sand, but the top and face of the dump, 120 feet high, is being covered with slag that flows in sand gutters from the reverberatories, or is wheeled out in the usual slag-pots from the blast furnace; but in a short time all slag will run from the furnaces into water troughs, be granulated, and then swept out to the dump, which will be protected from scouring out by the slag covering.

In the engine room is a 65-horse power engine, with a 40-horse power engine now on the way. A No. 5 Root blower is now used, but a No. 7 will be needed when the big blast-furnace is blown in. Power is transmitted by shafting, but mostly by wire cables running over large pulleys to different parts of the works. However, steam power may soon be replaced by electricity, as a plant is to be erected at the foot of the dump and supplied with Pelton wheels and water under a 250-foot head. On a tributory of the Columbia, not far from Trail, a very large water power has been secured by Mr. Heinze, who proposes the installation of an electric plant for the distant transmission of electrical energy which may be brought to the mines, as electricity has now become so successful and economical a factor in mining elsewhere. At present 100 to 120 tons of ore per day are being brought down from Rossland by the Tramway, but this amount will be greatly increased. At the smelter 140 to 160 tons, it is stated by the management (July 29), are being smelted daily, with a concentration of about 20 tons into 1 ton of matte, which matte goes to Butte to be refined; but already the foundations for a refinery at the smelter are nearly completed, in which the matte, after being crushed, will be further calcined in a reverberatory to be constructed, and then re-smelted in two of the present reverberatories, after which the product will be treated so as to yield a high grade copper matte for export, from which 80 to 90 per cent. of the gold and silver value has been separated for special refining and parting at these works.

From 175 to 200 men are now employed, and when all these improvements are completed, this smelting plant will be well equipped and capable of handling 350 to 400 tons of ore daily; and if the demand increases, a still larger plant can easily be added. Again, with the increased means of transport, and the building of roads into other mineral producing districts, access to other classes of ore may greatly better and cheapen the process of smelting.

Description of Mining Claims.

A description of all the chief mines and many of the most promising prospects is now appended. In respect to titles, a Crown grant is the final deed from the Crown, granted on the completion of $500 worth of work, while a claim held as a location requires that its owners each have a free miner's licence and do $100 worth of work per year, or pay $100 into the

Provincial treasury. Many other properties than these it has been possible to examine in a limited time, are being actively prospected and will be inspected and reported upon another time. The properties first described will be those lying on the slopes of Red Mountain, Monte Cristo Mountain and Columbia-Kootenay Mountain.

Le Roi.

Area about 21 acres. Title, Crown grant location, on a hill rising on the south-east slope of Red Mountain and ¼ mile N. W. from Rossland. The Le Roi Gold Mining Co., of Spokane, President, W. W. Turner; Gen. Manager, Geo. Turner; Assist. Manager, W. J. Harris; Sec., E. Williams, is capitalized for $2,500,000 in 500,000 shares at $5 each, and owns the Le Roi, the Black Bear and the small fractional claim, the Ivanhoe, or about 72 acres in all.

On this claim the large surface exposure, 6 to 14 feet wide, of the rusty-red iron-stained rock, or the typical iron cap, that on fracture proved to be the covering of a large body of sulphides, mostly pyrrhotite, with some chalcopyrite, could be easily seen for 200 to 300 feet in a N. E. by S. W. direction, when at the west end of this ore shute the vein seems to branch into two or even three smaller veins that diverge, the courses and continuance of which it is believed can be traced for some distance westward. At a point about 300 feet west of its east end line, the shaft was begun and sunk along the upper part of this body of sulphides on a slope of about 45° to the north, which slope or dip after 60 feet began to pitch steeper until from the 350 foot level to the bottom, now about 500 feet deep, it has become nearly vertical. More or less ore was found all the way down, but below the 150 foot work this big ore shute began to widen out. When the under-ground workings were examined (July) the shaft, 8x12 feet and 50 feet below the 450 foot level, was all in first-class ore, or the best ore yet found on this property. On the 450 foot level a very wide stope with all ore underneath, was being worked up towards the 350 foot level, the width of the ore body being the greatest at the west end, or nearly 35 feet, when it is cut off abruptly by a fault that extends up through the workings to the surface and dips easterly towards the shaft at an angle of 65° to 80°. Going east from the shaft this stope averages nearly 25 feet in width, when at a distance of 172 feet from the above-mentioned fault in the west end, the ore shute, now 20 feet wide, is cut off by another fault that crosses diagonally and nearly vertically, a fault that has also been encountered in all the workings above. This 450 foot level has not yet been extended beyond the west fault, but it has been through the east fault, showing a breast of nearly 12 feet of shipping ore, although this may not be the continuation of the large shute, further work being necessary to determine this. In the floor of this level, right in the ore shute, a 300 foot hole is being sunk along the pitch of the vein, with the Sullivan electric diamond drill, which is doing very satisfactory work and has been of great service in prospecting other parts of the mine in the search for and discovery of the faulted parts of the ore shute, and also of large bodies of low grade but shipping ore, back both in the hanging and also the foot wall sides of the main ore shute. Above this level the ore has been stoped for two floors, or 16 to 20 feet, and in the roof is seen 25 to 30 feet of ore, of which 13 to 14 feet is stated to be of the first-class grade, much of it being massive pyrrhotite and copper pyrites.

Coming up to the 350 foot level, the stope is found to be on an average 25 feet wide for nearly 170 feet, or between the two faults, while a drill hole in the hanging has shown that there is still 20 feet more of mixed but good grade ore. The influence of, or rather the displacement by the two faults is again evident, but on the east side after drifting 30 feet beyond the line of work, three drill holes, horizontal, were put in, one into the foot wall, showing, after passing through 20 feet of barren rock, 26 feet of low grade but probably pay ore, while another straight ahead, 40 feet, beyond what has been shown to be another fault plane, ran into a splendid body of ore in which a chamber over 20 feet wide has been made, in which further work was suspended until the ground was caught up with square sets. In the west end of this level near the fault, the stope is 12 feet wide of good ore with 10 feet of mixed ore in the hanging, and five feet in the foot Beyond the fault considerable drifting and prospecting with the diamond drill has been done, with as yet fairly good results.

On the 300 foot level, although a wide stope was made in good ore, a large amount of second-class ore is now being mined, as the system of timbering is advanced, and much ore of this character yet remains up through the upper works, all of which will be mined. All ore now brought to the surface, or 80 to 100 tons daily, is sorted into two classes, *i. e.*, the 1st class or nearly pure sulphides, and the 2nd class, or the mixed diorite and sulphides that comprises 10 to 15 per cent. of the whole mass. Much of the first-class ore is being shipped in waggons to Northport, crossing the Columbia River by ferry, and thence to the smelters,

while the tramway is taking an increased amount daily to the Trail smelter, although all ore bins are blocked up and two large piles of nearly 10,000 tons, averaging, it is claimed by the company, $25 to $35 in value, are awaiting shipment.

When the mine is fully equipped and prepared for exploitation in the most systematic manner, it will then be in a position to rapidly extend sinking operations, development levels and the breaking and hoisting of much more ore per day, and besides the high grade ore, the large reserves known to exist, of ore averaging $15 to $20 in gold, will be available. Extensive improvements are now in progress. (*a*) A new shaft of two compartments, each 4x5 feet in the clear, following down on the main trend of the ore body, will soon be completed from a point on the surface about 65 feet east of the present working shaft down to the 450 foot level, the sinking of which has been much retarded by the delay in getting the necessary squared timber, 8x8 inches for the upper part and 10x10 inches for the lower. A new hoisting plant is ordered that will consist of a 164-H. P. direct connected hoister, with two independent 5-foot drums, raising two skips of two tons each capacity. This machinery will come from the Jenckes Machine Co., Sherbrooke, Que. The boilers now in use, one 110-H. P., the other 90-H. P., will be utilized. (*b*) At the mouth of the Black Bear tunnel, running in from near the S.W. corner of the claim, on a vein thought to be one of the branches of the main vein, to connect in 700 feet with the present workings at a point above the 350 foot level, there is being installed a large 40-drill air compressor, made by the Rand Drill Co., Sherbrooke, Que., with three 125-H. P. steel boilers, by which very ample power will be got for mining and pumping purposes. The cost of this new plant will be from $40,000 to $50,000. The present plant consists of a seven-drill Ingersoll-Sargeant compressor, a Ledgerwood hoist, an Edison dynamo for lighting the mine and operating the diamond drill, 6 Ingersoll-Sargeant rock drills and 3 Little Giant Rand drills, a Cameron station pump, duty 640 gallons per minute against a 450-foot head, and a Knowles sinking pump, although but comparatively little water comes in this mine. On the surface, kept in good order, are the hotel and boarding houses, offices and laboratories, shaft house and ore bins.

Mr. John Moynahan, superintendent, who has had long experience in the Comstock mines, Nevada, and elsewhere, as soon as the above improvements are completed, will have the mine in good condition and the work laid out to give best results. Although the ground is strong, still all the slopes are being heavily timbered with square sets that will be kept close up to the face of work, and extended right up through all the old workings for greater safety and for greater convenience in working out the ore remaining. The new shaft will give good ventilation, though now the 450-foot level is kept very hot by the steam pipes to the pumps. Over 100 men are now employed.

On examining the mine, smooth walls may be seen following approximately the trend of the ore shute, giving the impression that a well-defined foot or hanging wall was there, but on breaking into these walls the ore may be still found. However, in several places it was noticed that the best grade ore terminated along such a wall, or in reality a tight crevice, usually with calcite, pyrrhotite and chalcopyrite arranged with more or less of a banded structure parallel to it, while the ore became of a more mixed character away from it. Again this line of fracture, with a wide band of calcite, may pass through the centre of the high grade ore which gradually becomes of a lower grade on either side. The amount of displacement along the two main faults has not yet been determined, but work done indicates that it is not at all great. Lesser planes of fracture with varying strikes and dips occur all through the mine as is seen elsewhere, and often, as along the main fault planes, there is gouge or crushed rock matter which was not seen along those planes parallel with the ore bodies against which the ore was found concentrated and closely attached. In the mixed ore, the sulphides are segregated along small cracks or seams, and although they often form an integral part of the mass of diorite, close examination might betray often the existence of extremely narrow channels through which the sulphide-bearing solutions gained entrance if these ore bodies were thus formed Again the calcite is found not only along the main planes but more or less through the mass of rock, and crevices are often filled with it. Masses of calcite and sulphide, with some quartz, are segregated in greater or less amount irregularly through the ore-bearing diorite.

The supply of wood and water is nil, the water supply being pumped up from the creek in the Centre Star gulch, but a small box flume is being put in to bring water about 2½ miles from near the Jumbo mine. Means of transport are now excellent, the tramway running to the ore bins, while the Red Mountain Railroad will pass in a very convenient location.

War Eagle, Iron Mask, Virginia and Poorman.

Although each of these claims is the property of a distinct and separate company, they are all under one management, Mr. F. E. Lucas, Spokane, being Secretary, and Mr. James Clark, Rossland, Superintendent. All these claims have been Crown granted and lie along the north side lines of the Centre Star and Idaho. The War Eagle Gold Mining Company is stocked for 500,000 shares, at $1.00 each; the Iron Mask, for 500,000, at $1.00; the Virginia, for 500,000, at $1.00, and the Poorman, at 500,000, at $1.00.

The War Eagle, Iron Mask and Virginia are being worked by the use of compressed air, the plant consisting of a 20-drill Rand air compressor and two 100-H.P. boilers, being located by the creek in Centre Star Gulch, and on the line between the Iron Mask and Virginia, and the air carried in pipes to the points of working.

On the *War Eagle*, the vein runs nearly east and west, dip N. 65°, and passes on the east into the Centre Star claim. In the first workings shaft No. 1 was sunk over 70 feet in a shute of low grade ore that assayed from $12 to $16 in gold, but about 300 feet west was found, while the claim was under bond to Mr. P. Clark, a splendid ore shute of high grade ore that averaged over 2¼ ounces in gold from the surface, and in which the stope at the surface, extending down to tunnel No. 1, is 120 feet long and 8 to 12 feet wide, where the ore before being mined was clean sulphides, or pyrrhotite and chalcopyrite. At the west-end of this shute the ore becomes scattered through the diorite, and a fault, strike N. and S. and dip about 60° W., has apparently dislocated the vein about 45 to 50 feet to the south, beyond which the ore was of a lower grade and the stope at the surface was 35 feet long and about 5 feet wide. Tunnel No. 2, 900 feet long, passed through these shutes, No. 1 being the ore followed down by No. 1 shaft, and extending with an average width of 3½ feet for 80 feet. Shute No. 2 was a 100 feet long and was mined out to the surface in the large stope discribed above, but in the floor the ore 2 to 4½ feet wide remains untouched. Shute No. 3 was 40 feet long and worked out to the surface, leaving 3 to 4 feet of ore still beneath.

Tunnel No. 2 is 126 feet, vertically, below tunnel No. 1, 1,100 feet long, and near its mouth is a shaft sunk 35 feet in an ore shute of low but good grade, which follows the tunnel for 160 feet along the floor as if it were the apex of another ore shute, for shute No. 1, in tunnel No. 1, does not appear in tunnel No. 2, but shutes Nos. 2 and 3 appear to come together between the two tunnels, for in the lower tunnel is found, corresponding to the position of the two above, one shute of high grade ore, much of which, taken out in running the tunnel, had an average gross value of $57.60 per ton, 310 feet long and from 2 and 3 feet up to 12 and 14 feet wide of solid ore, which, as yet, has been untouched except (*a*) where a station is being cut for a hoisting plant for a shaft to be sunk from the tunnel level at a point where this shute is widest: (*b*) and in an upraise to tunnel No. 1 which upraise was in ore for 80 or 90 feet when it passed through the barren diorite that on that level separates Nos. 2 and 3 shutes.

Faults have been found all through these workings that have given considerable trouble in tracing out the ore shutes and evidently the same fault that appears at the surface, cut off the big ore shute in the lower tunnel where the ore is 4 to 5 feet wide. But much more development work will be needed to clearly define the courses of these ore shutes and to explain the nature and extent of the slips.

On the *Iron Mask*, shaft No. 1 was started on a narrow crevice, apparently the continuation of the Josie vein, that went down vertically for 20 feet when it began to widen out until the shaft was nearly all in a fine high grade ore that averaged 2.3 ounces, gold, down for 100 feet, when 50 feet of drifting was done. Further work was suspended until the main working tunnel that is being driven in from Centre Star Gulch, starting where a road cutting laid bare the top of a shute of ore, again of first-class grade. The tunnel ran for nearly 120 feet through a mixed ore where a slip was encountered, beyond which the tunnel was then pushed straight ahead for No. 1 shaft, after connecting with which it will turn to the right, and run under tunnel No. 2, War Eagle, at a depth, vertical, of 250 feet. At the mouth of this tunnel, shaft No. 2, with two compartments, is being sunk down on the dip 70° N., and was 36 feet deep with about 3½ feet of ore exposed. A shaft-house has been erected and a gallows frame, and a hoist and pumps operated with compressed air will soon be at work.

The *Virginia* is being developed by a tunnel, then 60 feet long, running to tap an ore body exposed in a small shaft higher up.

The *Poorman* fraction is on the continuation of the Josie vein, and a tunnel is now being pushed forward, it being connected with a 92-foot shaft, and some ore is being taken out.

On the War Eagle, ore bins have been erected, to which will be run a short spur from the tramway, but in the meantime ore is being hauled in waggons and loaded on the cars near the Le Roi, and then sent to the Trail Smelter. Number of men employed by Mr. J. Clark, 80

Centre Star and Idaho,

Area about 40 acres; title, Crown grants. Located in 1890, immediately east of the Le Roi and War Eagle, owned by the Centre Star Gold Mining and Smelting Co., President, A. A. Largy; Secretary, T. G. Benham, Butte, Montana; General Manager, Oliver Durant, Rossland. Capital stock, 500,000 shares, at $1.00 each. This property is considered to be one of the best in the camp. Across the east end of the Centre Star claim, runs in a northerly direction Centre Star Gulch, on the east side of which in a diorite bluff is exposed a ledge 30 to 50 feet wide covered with the heavy iron-stained rock or true iron capping from the decomposition of the sulphides here present in mass. On either side of this ledge is a smaller one. The main tunnel enters on the out-cropping of this main ledge on the west side of the gulch and runs S.W. about 1,100 feet along the lead, heading for its objective point the Le Roi east end line. Several large bodies of low grade ore are traversed, one of nearly massive sulphides or pyrrhotite being 147 feet long and 14 to 16 feet wide, while another is nearly 70 feet wide. From this tunnel cross-cuts are being run to the side lines, and in one to the north, the "north vein" was cut at 280 feet where it is 4 to 6 feet wide of good ore, with a larger percentage of copper than is found elsewhere in the mine. At 180 feet in the crosscut to the south, the "south vein" was cut but there it is small. Mr. Durant states that besides the large amount of low grade ore now in sight, there is much good shipping ore, but none will be shipped until the mine has been thoroughly explored and opened up for work and the conditions for shipping and smelting are the best. Already nearly 2,000 feet of work have been done, and the ore taken out is being stored in a large dump for future use. There is at the tunnel-mouth a good blacksmith shop and engine room, in which is a 7-drill Ingersoll-Sargeant air compressor and an 80-H.P. boiler, now running three drills in the mine with which 1,600 feet of work have been done since December 5th, 1895. Ventilation is secured by running pipes fitted with compressed air exhausts from the face of work to a shaft sunk on the lead and tapping the tunnel 410 feet from the mouth. After further work has been done a large shaft will be sunk, and a heavy hoisting plant put in, probably near the west end of the claim, and both railways will be easily available. Work will also be done soon to exploit the Idaho ground into which the large exposure mentioned leads, and has been traced through into the Enterprise claim on the east. Number of men at work, 23.

Josie, Monte Cristo, St. Elmo, Mayflower.

These four properties have been incorporated under four distinct companies, for all of which Mr. F. E. Snodgrass, Spokane, is secretary, and Mr. Frank C. Loring, mining engineer. The capital stock of the Josie is 700,000 $1.00 shares; of the St. Elmo, 1,000,000 shares at $1.00 each; Monte Cristo, 1,000,000, at $1.00, and the Mayflower, 1,000,000. at $1.00 each share. Under the careful supervision of Mr. Loring all these properties are being economically and systematically developed. The claims all have Crown grant titles.

The *Josie* is situated along the north side of the Le Roi, and south of the War Eagle, and through its length can be traced on the surface two veins, the "main" and the "north" that have been opened up by several workings. The main tunnel was begun in ore, that was soon cut off, and run in along a smooth wall, strike, N.E. by S.W., dip northerly, until a fault was encountered with a throw to the south, beyond which extends a stope for 90 feet that runs up 30 to 40 feet, with ore 1 to 4 feet thick, and connects with the surface by a shaft. At a point about 250 feet from the tunnel mouth, in a short crosscut, a diamond drill hole to the north at 107 feet located ore supposed to be the north vein. Beyond this point the tunnel runs for about 100 feet between two walls, nearly vertical and parallel, 5 to 6 feet apart, with ore in the roof, sometimes 3 feet of solid pyrrhotite, but much sulphide is also scattered through the diorite, and calc spar. Another faulting to the south is now met, and at this point a crosscut is driving north to connect with No. 4 shaft that is being sunk in ore in the north vein, the top of which shaft is 160 feet above the tunnel. A crosscut, south, shows some ore for 12 or 15 feet, while the face of the tunnel, in 480 feet, showed a little mineral. On the surface is a stope about 120 feet long, 3 to 4 feet wide, from which considerable ore was taken, and at the mouth of the tunnel in the ore there found, is being sunk a two compartment shaft, now 80 feet deep, and in ore which is being sorted and shipped with other ore in the mine to Tacoma. In the engine-house, 30 by 60 feet, is a 7-drill Ingersoll-Sargeant compressor, and an 80-H.P. boiler, a good gallows frame, connections with the Cameron sinking pump, and a 30-H.P. boiler. Value, $12,000. A crosscut tunnel is now being run from the Le Roi boundary, 250 feet, to tap the shaft. Number of men, 30; Superintendent, Mr. Long.

The *St. Elmo* is a full claim, 600 by 1,500 feet, on the south slope of Red Mountain, having near the west end a large exposure of very quartzose rock containing also calcite, zinc blende, and iron and copper pyrites. Just east of this is a 100-foot tunnel to the N.W., in a fine grained diorite(?) with much iron and copper pyrites disseminated through the mass. Nearer the east end is the main tunnel, 225 feet long, with crosscut, the tunnel running along a wall E. and W. along which some ore has been taken out. The position of this claim is clearly indicated by a prominent bluff of rock deeply stained with red iron oxides, and the vein traversing the Monte Cristo, the Cliff and St. Elmo Consolidated, is believed to run through this ground. Number of men at work, 5.

The Monte Cristo is another full claim 600x1,500 feet, located on the west slope of Monte Cristo Mountain, one mile west of Rossland, and has running through nearly its entire length, one of the most strongly defined ledges in the camp. The very fine grained country rock is little iron-stained itself, but on the ledge there is a heavy iron capping which, on being opened up, discloses 8 to 12 feet of solid pyrrhotite. Six or seven openings have been made, and work is now being done in a prospecting shaft to be 60 feet deep, tunnel No. 2, about 85 feet, with face all in a coarsely crystalline pyrrhotite, but having in the bottom a better grade of ore containing copper pyrites and calcite, and in tunnel No. 1. This tunnel is to be the main point of entry, and is being driven of a good size, well timbered at the mouth, with sets 5x6x7 feet, having at the time of visit a full face of ore. So far, this large shute of sulphides has proved valueless, assaying from traces to $2 or $3 in gold, but with the advent of a new character of ore in tunnel No. 2 much better assays are being procured, and the development of this claim is being watched with great interest. To expedite work, a 7-drill Ingersoll-Sargeant compressor and an 80-horse power boiler are being put in near the small creek 200 feet below, and then the main tunnel will be rapidly advanced along the vein into the mountain. Course of vein, east and west dip, 70° to 75° north. Number of men, 20. Superintendent, Mr. F. H. Oliver. A spur one-half mile long can easily be run from the tramway to a point below Tunnel No. 1.

The Mayflower is in the "South Belt," or one mile south of Rossland, and the present work is being done in a tunnel, now 100 feet long, run in at track level, upon a vein that was exposed by a rock-cutting on the tramway. This vein, running about east and west, dip north 70° to 80°, showed for 30 feet along the tunnel, carbonates, until the solid ore came in, or solid iron pyrites, with a large proportion of galena, also some zinc blende and calcite carrying the chief value in silver, or on a shipment netting $56, $40 was silver, $10 gold, and $6 lead. The vein varies in width from a few inches to 3 feet, and can be traced by openings through the claim, while a parallel vein to the north has been more or less developed. The carbonates are sacked and some have run as high as $250, and the ore taken out is being piled by the track, and sent down in lots to the smelter at Trail. Number of men employed, 10. Superintendent, F. H. Oliver.

North of the Le Roi and War Eagle lie a number of claims on which ore has been found, and on which work is being done, as at *No. 1, Surprise, Gertrude, Monita, and Pilgrim*, and on the *Mug Wump*, that lies just north of the *Iron Mask*, a plant is now being put, under the management of Mr. J. Young, to exploit this property with the diamond drill.

California.

Area, 52 acres; title, Crown grant. Location, 1,500 feet west of the Le Roi and Josie mines, on south slope of Red Mountain, owned by the California Gold Mining Company, Spokane. President, Hon. R. F. Pope, Cookshire, Quebec; Secretary and Treasurer, J. P. Graves, Spokane. Capital stock, 2,500,000 shares at $1 each. Near the southern end of this claim is a 50-foot tunnel running north into barren country rock, and higher up are several shallow cuts and trenches. On all this claim the rock on the surface is very much iron-stained and decomposed, but no work has been done as yet disclosing the veins that are supposed to pass through this property. Mr. Frank C. Loring, one of the best mining men in the camp, will also direct the development work, which will consist at first of extensive surface work, trenches, and open cuts, etc.

Nickel Plate.

Area, about 21 acres; title, Crown grant. Location, immediately south of the "Centre Star," and "Idaho." This claim, and the small fraction, "Ore-or-No-go," are the property of the Nickel Plate Mining Company, of Salt Lake City. Capital stock, $500,000, in $1 shares Superintendent, W. J. Williams, Rossland. Considerable careful development work has been

done on this property, a shaft 150 feet having been sunk along a smooth wall with some ore present. At the 100-foot level a drift has been driven over 100 feet east and 110 feet west (July), showing more or less ore, dip 60° north. From the shaft a crosscut has been driven 285 feet north through the diorite, intersecting at 110 feet a shute of ore, which, in a stope 25 feet high, is 2 to 3 feet wide, of solid sulphides, consisting of pyrrhotite and copper pyrites, stated to be of high grade. This ore is also found scattered through this rock or gangue, and over a hundred tons are on the dump awaiting better shipping facilities, as the line of Railroad is surveyed to cross the claim near the shaft that will give easy access to the smelters. The crosscut will connect with the air-shaft, which is now being sunk near where on the surface some ore is showing, and, after further development work proves up the value of the claim, a large and complete hoisting plant will be installed, the present plant—a 12-horse power boiler, blower, and a Knowle's sinking pump—being sufficient for the present exploratory work. Number of men employed, 22. In Centre Star Gulch a shaft is being sunk on a vein that out-crops there, and ore is being taken out.

City of Spokane.

Altitude 3,900; area, 20½ acres; title, Crown Grant. Location, on the west slope of Monte Cristo Mountain, and east slope of Red Mountain, north of the "Iron Mask," and half mile north of Rossland. Owner, the Lillooet, Fraser River and Cariboo Gold Fields Company, Limited. Managing director, F. S. Barnard, Vancouver, B. C.; Secretary, E. A. Bennett, London, England; Superintendent, D. McGuire, Rossland. On this claim a prospect shaft having disclosed the presence of ore, a tunnel 6x5 by 6½ feet in the clear is now being run easterly from a point near the centre of the claim, just above the road, and on a level with the tramway, 500 to 600 feet distant, and in the face of the tunnel, 85 feet, in is a width of nearly 3 feet of solid pyrrhotite and iron pyrites, carrying some copper pyrites and gold, while on the north side more or less ore is seen for 15 feet back, the average value of which has not yet been determined (July 13). An air compressor plant, a 3-drill, 12x16 "Rand," bought of Fraser and Chalmers, Chicago, and one 45-horse power boiler, will soon be installed at the mouth of the tunnel, which will then be rushed ahead vigorously to exploit this property, to determine the extent and grade of the gold ore now showing; and if favourable results are obtained, a proper working shaft will be sunk, while transportation facilities, as shown above, will be excellent. A small stream of water close by will supply the compressor and boiler, while there is considerable wood suitable for fuel, but limited in amount for mine purposes on the property. So far, three houses for the men and superintendent have been erected. Number of men employed, 18.

Red Mountain.

Title, Crown grant, applied for. Location, south of Cliff Mine, and west of the City of Spokane. Owned by the Red Mountain Mining Company. Secretary, F. Lewis Clark, Spokane. Capital stock, 1,000,000 shares of $1 each. Superintendent, B. Young, Rossland. Work is being now done on a fissure, along which at the surface as much as 3 to 4 feet of low grade pyrrhotite with some copper pyrites and sulphides have been found. A working shaft, 20 feet deep at time of visit, is being sunk, while about 350 feet east a tunnel 85 feet in length is cross-cutting the country rock in search of the ledge that shows immediately above on the hill. Number of men, 10. Foreman, D. W. Peoples.

Cliff

Area, 15.7 acres. Title, Crown grant. Location, east slope of Red Mountain, one mile north of Rossland. Owned by S. M. Wharton, Geo. C. Wharton, Jno. R. Cook, *et al*, Spokane. Gen. Manager, S. M. Wharton. The well-defined lead on this claim is believed to run through the St. Elmo Consolidated, St. Elmo and the Monte Cristo. About the centre of the claim is a 45-foot shaft, full of water, with several tons of ore at the top, and below in the hillside several open cuts along the ledge from which there has been taken high grade ore. The lead can be easily traced through the claim, but the faults met with in the underground workings show plainly at the surface. In a tunnel 350 feet long, with 100 feet of cross-cuts, there is for the first 90 feet solid ore, low grade, averaging 4 feet wide, then a slip throws the ore 20 feet to the north-west, the shute then continuing for 65 feet, beyond which it is much broken up and a small stringer of ore 2 to 10 inches wide is found running east and west. One hundred feet lower down is tunnel No 2, now being driven ahead with a machine drill. For 65 feet the tunnel is all in the coarse grained pyrrhotite that assays a few dollars in gold, with

a fault of 5 feet to the north and the continuation of this shute for 90 feet further, being in places 12 feet wide but also low grade. Faults are now met with, beyond which the ore has not yet been found. At the upper or west end of the claim it is claimed the best ore has been found, and tunnel No. 2 will be run through to develop this ground. Considerable ore has been shipped but so far it has proved to be of such a grade as left but a small margin of profit. At the engine house are a 3-drill Ingersoll-Sargeant compressor and a 35-H.P. boiler. No. of men 14. Strike of vein nearly S. W. by N. E. Dip N. W. 60° to 80°.

Immediately west of this claim is the *St. Elmo Consolidated.* Title, Crown grant. Owned by Jno. R. Cook, S. M. Wharton, *et al*, not being worked. A shaft 48 feet deep and a tunnel about 60 feet long comprise the work done, and at the shaft a considerable amount of iron sulphides is piled up. West of this claim is the St. Elmo already described, while north of these claims is the *View*, near the summit of Red Mountain, owned by the Red Mountain View Co. President, W. S. Johnson, Sec. A. F. Corbin, Rossland. Capital stock, 1,000,000 shares at $1. Title, Crown grant. A tunnel 45 feet long begins on a vein about 15 inches wide and then runs S. W. along a narrow width of ore that in the face of the tunnel widened to nearly 3 feet of mixed ore, or diorite, pyrrhotite and a good percentage of copper pyrites. This tunnel will be now advanced under the charge of Mr. W. S. Haskins, of the Jumbo mine

West of the St. Elmo is the *Mountain View*, in a tunnel on which considerable mixed ore is in sight, and below which the main tunnel was being started. North of the St. Elmo and on the summit of Red Mountain are two fractional claims of about 18 acres in all, the *Peak* and the *Sam Hayes.* All the surface rock is heavily iron stained, but very little work has yet been done to show the condition of affairs, however in several small openings there is exposed more or less rock matter impregnated with iron and copper pyrites. These properties have lately been bonded to Mr. Pritchard, London, Eng., who purposes doing extensive exploratory work with the diamond drill.

Jumbo.

Area, 21.6 acres. Title, Crown grant. Location, 2¼ miles west of Rossland on west bank of east fork of Sheep Creek. Owners, the Jumbo Gold Mining Co. General Manager, M. R. Galusha, Spokane; Superintendent, W. S. Haskins, Rossland; 1,000,000 $1 shares On this claim is a very prominent exposure of iron-stained, fine-grained eruptive rock with more or less decomposed sulphides, in which a shaft was sunk showing some low grade ore, and afterwards a tunnel was run in about 260 feet with about 125 feet of crosscuts. For 150 feet there was no ore, then the tunnel entered and continued for nearly 90 feet in a body of very low grade, coarse-grained pyrrhotite in which however there is ore containing some copper pyrites, mispickel and calcite that carries enough value in gold to make it shipping ore. No ore has yet been sold. A good waggon road, 1¼ miles long, has been built from where the Red Mountain Railroad will intersect the Northport road up to the mine, and a new tunnel is now begun about 200 feet north and 175 feet below the upper tunnel described, and as this advances, crosscuts will be run. The trend or conditions of this large body of sulphides are not known, but immediately to the west is what appears to be a large dyke of very coarse-grained syenitic rock from 200 to 300 feet wide, strike N. and S. An air compressor and a diamond drill may be bought to expedite exploratory work. No. of men at work, 7.

Near the claim, the High Ore is being prospected by a tunnel at the north end line of the Jumbo, for the continuation of the Jumbo ore shute, while across the creek the Nevada is also running a tunnel in search of the same. The Good Hope has piled up at the top of a small shaft some low grade ore, but no work was being done at time of visit. North from the Jumbo, the Gold Hill has run a tunnel 350 feet west to strike an ore shute high up on the line but without success, and the Comet is being prospected with open cuts and a shaft.

The O. K.

Title, Crown grant. Location on the south slope of Spokane Mountain, off the Northport road, 2½ miles west of Rossland. Owned by the O. K. Gold Mining Co. Capital stock 1,000,000 shares at $1 each. Gen. Manager, J. L. Warner, Rossland. On this claim are found conditions quite different from any other in the camp, there being a regular fissure vein with a quartz gangue, containing free gold, and also a good percentage of sulphurets, such as iron and copper sulphides and galena, the country rock being a fine grained eruptive rock. Three tunnels have been run in, one for about 70 feet, the second for 400 feet, and the upper nearly 300 feet. The vein presents the usual characteristics, varying much in width

from a few inches to five and six feet of ore, in which considerable stoping has been done, the ore going to a small 5-stamp mill, by which the free gold was amalgamated, and thence to concentrators, the Perfection bumping table and a Woodbury machine, by which the sulphides were saved. At present a new mill is being erected, to contain at first two 5-stamp batteries, two Blake crushers, automatic feeders and concentrators. In the engine room will be two 40-H.P. boilers and a 5-drill Rand air compressor, for operating rock drills, and a diamond core drill. The ore will be brought from the mine in a gravity car-tram, 600 feet long and dropping about 200 feet, while the water for the mill will be pumped up with a steam pump from Sheep Creek. It is stated that about $20,000 have been taken from this mine, but an exact authorative account could not be obtained in time for this bulletin, but will be included in the next annual report.

Great Western and Golden Chariot.

Area, 66 acres. Title, Crown grants. Location, foot of Monte Cristo Mountain, and north of Rossland townsite. Owners, the Great Western Gold Mining Co. Secy. H. M. Stevens, Spokane; Gen. Manager, C. E. Barr, Rossland. Capital stock, 1,000,000 shares of $1 each. This claim is traversed in a N. E. and S. W. direction by a wide iron-stained mineral zone in which three prospect shafts have shown low grade gold ore assaying $3 to $4, this ore being in places massive pyrrhotite but mostly diorite impregnated with this sulphide and some iron and copper pyrites, also calcite. No definitely defined ore body has yet been found, though prospecting is being done by sinking vertical and inclined diamond drill holes from the bottom of a 50-foot shaft near the centre of the claim, but near the east end a shaft will soon be started, and with an air compressor, about to be ordered, systematic prospecting will be prosecuted with all speed by Mr. Barr, who has done much mining in Colorado. Near the west end is exposed a narrow vein, 2½ feet wide, of solid sulphides, as yet of small value in gold, in which is a 22-foot shaft. This property has large surface showings, and, being owned by a strong company, will be carefully explored.

The Enterprise.

Area, 20.65 acres. Title, Crown grant. Location, at foot of Monte Cristo, east of Idaho, and west of Great Western. Owned by the Enterprise Gold Mining Co., of Ohio. Capital stock, 1,000,000 shares at $1 each. Gen. Manager, W. A. Ritchie, Spokane. This property is in the hands of a strong eastern company who intend extensive development work, and are at present prospecting the surface by trenching and sinking test shafts. Near the N. W. corner two shafts are sunk in the vein from the Idaho, in which there are from 2 to 4 feet of ore, low grade, of massive pyrrhotite with some iron and copper pyrites. Number of men, 7.

Evening Star.

Area, about 20 acres. Title, Crown grant. Location on the east slope of Monte Cristo Mountain, between the Monte Cristo and Georgia claims, and one mile north of Rossland. Owned by the Evening Star Gold Mining Co. President, D. M. Drumheller; Secretary-Treasurer, Jules Prickett, Spokane. Capital stock, $1,000,000 in $1.00 shares. Superintendent, J. M. Scrafford, Rossland. On this claim is seen a large exposure of much decomposed rock through which appear to run two ledges, but at present it is yet difficult to form any definite idea as to what are the true conditions. Considerable stripping has been done, and from this ore taken from the surface, 22 tons shipped to the smelter at Tacoma, netted $32.80 in gold, per ton, as per statement by letter from Mr. H. B. Nicholls, until recently Secretary-Treasurer. A tunnel was run into this rock 50 feet, with ledge matter at the mouth, but nothing was found until recently. On continuing this work a few feet, a small stringer of ore widened out to a considerable width, in which was quartz showing free gold. Sixty feet below this tunnel a second is being driven, which at about 135 feet is expected to strike the ore found above, but as yet, development work must be awaited, and in the meantime all ore taken out is being piled. A short haul by waggon road will land ore at the tramway. Number of men, 11.

C. and C.

Area, 13 acres. Title, Crown grant. Location, south of the Evening Star. Owned by J. H. O'Leary, Capt. Gore, Philip C. Woolly, *et al.* A shaft, 6 by 6, was down 30 feet, all in a low grade mixed ore of fine grained diorite and pyrrhotite, copper pyrites, mispickel and

calcite, and, encouraged by this very favourable showing, work is being advanced as quickly as possible. Number of men at work, 8. The continuation of this vein is believed to be on the S.E. end of the Monte Cristo claim.

Georgia.

Area, about 50 acres. Title, Crown grant. Located on the east slope of Monte Cristo Mountain, east of the Evening Star and C. & C. Owned by the Georgia Gold Mining Co. Capital stock, 1,000,000 shares, at $1.00 each. General Manager, Jas. L. Warner, Spokane. Superintendent, — Newman, Rossland. On this claim a tunnel was started in under an iron capping, cutting through 4 or 5 feet of mixed ore and rock, and run about 100 feet with a crosscut 40 feet west, and another 16 feet. Several feet below, another tunnel is being driven S.W. with a machine drill operated by steam, and was in 80 feet (June 30) in a very fine grained, light coloured rock, the intention being to push forward this work to prospect the claim on the surface, of which in many places is found the rusty iron-cap and sulphides assaying in gold. Number of men at work, 12.

Iron Horse.

Title, Crown grant. Located east of Virginia, on south slope of Monte Cristo Mountain. Owned by the Iron Horse Gold Mining and Smelting Co., Spokane. Capital stock, 1,000,000, $1.00 shares. There is a large ledge exposed on this property in which are sunk two shafts, to one of which is run a tunnel about 100 feet long and then crosscuts, exposing a large body of sulphide ore, pyrrhotite and copper pyrites, of which there is a large amount on the dump, but the value of which was not ascertained. Prospecting with the diamond drill is being carried on by Mr. Hector McRae, of the Kootenay and Columbia Prospecting and Mining Co., who has a contract for sinking 1,200 feet of holes.

Several other properties on this mountain are being explored, such as the Silverine, Iron Colt, and North Star.

Columbia and Kootenay.

Title, Crown grant. Location on N. E. side of Kootenay Mountain, 1¼ miles N. E. of Rossland. Owners, the Trail Mining Co. Stock, 2,500 shares, at $100 each. President, H. P. Mason, Frankfort, Kentucky; Secretary, Geo. E. Milligan, Chicago, Ill.; Superintendent, Martin King, Rossland. Besides these claims, this company owns the adjoining locations, the Tip-Top and Copper Jack. On the Columbia-Kootenay property, much prospect work has been done, disclosing by means of tunnels, shafts and open cuts, the existence of an ore-bearing zone running N.E. by S.W., dip 45° to 75° N.W. through both claims, the rock on the surface heavily iron-stained, with decomposed masses of sulphide ore exposed, which proves to be (*a*) pyrrhotite, both massive, and scattered through a hard fine grained gangue with a little chalcopyrite, and (*b*) more or less mispickel or arsenical iron ore; the surrounding country rock being diorite that may be found from very fine close grained to typical coarse grained rock, exhibiting distinct crystals, in places, of biotite mica. In the underground workings, as far as examination was permitted by the presence of water accumulated since suspension of exploratory work, which will be further prosecuted after the installation of the air compressor plant, much of the ore appeared to be strung out in irregular laminæ of sulphides, calcite, rock matter, and some quartz; but the relation, if any, of such arrangement to walls or planes of fracture could not be determined for the above reason. The ore also is found massive, or scattered through the gangue or along many small cracks, as was clearly seen in a lower shaft where the sulphide was iron pyrites. At the north end of the Columbia claim a porphyry dyke that can be traced with almost a certainty for over two miles, 30 to 40 feet wide at the least, crosses the upper tunnel at its mouth, on a course running true N. and S., but no radical displacement is yet apparent, and on both sides of the dyke solid sulphide ore has been found, while in one place a stringer of quartz was noticed between the dyke and the diorite. Two carloads of ore have been shipped to the smelters to determine its value, one carload from one part of the mine proving too low grade to be profitable under existing conditions, the other from another part yielded, it is reported, over $50 in gold per ton.

Upon the south end of the Copper Jack claim, convenient to a stream of water, an air compressor plant is being put in place, to consist of a 30-drill Ingersoll-Sargeant compressor, and three 125-H.P. boilers, whence air will be carried in a 6-inch pipe to the two tunnels, 700

and 850 feet, respectively, higher up the claims, and if further work warrants it, a tunnel will be run a little above the plant. The value of plant to be about $20,000. There is an abundance of good timber for fuel and mine purposes, and for transportation facilities the surveyed line of the S. F. and N. R. R. passes below the present workings, while a good waggon road from Trail leads up to the site of the engine house. This is the property most developed upon this mountain, and its success will mean the active development of other and contiguous claims. Men employed (July 6), 15, preparing site for plant.

South Belt.

On Lake Mountain, south of Rossland, and in the intervening valley, also on the east and south slopes of Deer Park Mountain, all of which, with Look Out Mountain farther east, may be known as the South Belt, the same system of east and west fissures obtain, and, with the comparatively little work done, the results are such as to encourage the much more extensive investigation of many of the claims. With the exception of the Crown Point and Deer Park, the ore bodies have not yet been found of large size, but the fissures are very persistent and the average ore is of, so far, fair value, the ore on most of these properties being different from the rest of the camp in that there is very little pyrrhotite, but much iron and arsenopyrites, with some zinc blende and galena, while the silver value is higher than the gold. But pyrrhotite ore is also found as will be detailed below. The construction of the tramway through the centre of this belt has rendered easy the shipment of ore, and already the Crown Point and Mayflower are shipping.

G. R. Sovereign.

Area, 52 acres. Title, Crown grant applied for. Location, about one mile south of Trail, on Look-Out Mountain, and about 1,400 feet above that town. Bonded to Gen. J. Warren, Butte, D. R. Harris, Victoria, *et al.* Much interest centres in the prospect work being done on this claim, that is six miles east of Rossland, and in a shaft, now over 30 feet deep, ore has been followed all the way down, consisting of low grade pyrrhotite in the diorite, until now, when more copper pyrites, quartz and calcite are coming in with a rise in the gold assay values, an assay for Gen. Warren on all the ore coming out recently, giving $16.40. On the surface the rock is much iron stained by the decomposed sulphides present, and work is to be pushed much faster to prove up the claim before the expiration of the working bond, May 1st, 1897. This very favourable showing on this mountain is promoting other work, and some claims will be prospected with the diamond drill by Mr. Hector McRae.

Crown Point.

Location, on the south belt, south of Trail Creek, on the north slope of Lake Mountain, 2½ miles S. E. of Rossland. Titles, the Crown Point Crown grant, No. 981, White Swan and Hidden Treasure, locations. This group of three adjoining claims is the property of the Crown Point Gold Mining Co, Spokane, Wash. Pres., Jno. B. Finch; Secy., H. K. Galusha, Spokane; Superintendent, V. D. Williamson, Rossland. Until last April the Crown Point was under different management, under whose direction a shaft or incline, dip about 50°, was sunk 130 feet, encountering at 60 feet a dyke, which is now clearly shown upon the surface as 30 to 40 feet wide, strike north and south, dipping to the east 60°. Owing to bad air and water it was impossible to inspect the lower workings, but they were described as consisting of a drift at the depth of 70 feet, for 90 feet along the dyke, having, for 60 feet, ore, while at 50 feet a wing was sunk 20 feet, again along the wall of the dyke, at the bottom of which it is claimed there were four feet of solid sulphides. At the bottom a drift was run west 100 feet with a cross-cut 50 feet, and an east drift of 75 feet, with a 50-foot cross-cut, all in barren diorite, the workings having probably been deflected from the ore zone by following along the dyke. On the surface on either side of the dyke, apparently with little or no displacement, is exposed, when the iron capping is removed, a body of sulphide ore, or massive pyrrhotite with some copper pyrites, from 3 to 8 feet wide, strike, a little north of west, dip, S. into the mountain 45° to 60°, the enclosing country rock being a fine grained diorite, so common in the claims along this slope. At the top of the shaft the ore is about 7 feet wide, and down it for 35 feet it is 3 to 5 feet wide, while it is fully 7 feet wide where it is being stoped out.

A waggon road has been built for about ½ mile down to the C. & W. R. R. tracks, from which a spur can easily be brought to a point below the main tunnel that is now being driven

350 feet to tap the ore shute 150 feet west of the dyke, 170 feet below the surface. On the dump were piled several hundred tons of ore, of which regular shipments to the Trail smelter have begun, the first returns for which are reported as being very satisfactory. Number of men, 14.

West of this property are three claims, all held under Crown grants, the *Tiger*, *Uncle Sam*, and *Gem*, through which runs what is believed to be the continuation of the Crown Point lead, the country rock being a fine-grained greenish diorite. On the Gem and Uncle Sam two shafts were sunk near the dividing end line, and some low grade ore taken out, consisting of mispickel with some copper pyrites and zinc blende and some quartz and calcite, but no work was being done at time of visit. On the Tiger a cross-cut tunnel was in 160 feet east to explore the ground under a heavy iron capping on the surface. To the south of this an open cut into the iron capping uncovered 3 to 4 feet of very good-looking ore which a tunnel and cross-cut below failed to strike. Work has been retarded by bush fires that lately destroyed all the buildings. Agent, Mr. N. Campbell, Rossland.

South of the Crown grant are three claims, the *Southern Cross*, *Wolverine No. 2*, and *Iron Hill*, on the first of which is a Crown grant, owned by the Southern Cross and Wolverine Consolidated Gold Mining Company. President, Thomas Smiril; Secr tary and Treasurer, D. B. Bogle, Rossland. Capital stock, 500,000 $1 shares. On the Southern Cross two open cuts and two tunnels, one 75 feet, the other 90 feet long, are made in the very iron-stained diorite to develop a well-defined fissure, in which the ore in places widens out from nothing to 2 or 3 feet of solid sulphides. In the 90-foot, or working tunnel, at ten feet, is encountered what is probably the Crown Point dyke, down along which a winze was sunk 25 feet with 2 or 3 feet of low grade pyrrhotite, copper pyrites, and blende, when water caused work to be stopped. On the Wolverine there is a large exposure of iron-stained rock with stringers of sulphides, but no work has been done yet to develop the conditions that may prevail.

Further west, are the *Trilby*, *Last Chance*, and *Celtic Queen*, on the last of which 2 to 4 feet of mixed sulphides have been found along an east and west fissure that is crossed by a large north and south dyke without any observable displacement. Development work is now proceeding under Mr. Dennis Clark, Rossland.

R. E. Lee and Maid of Erin.

Area about 100 acres; title, locations. Located one mile south of Rossland. Owned by W. Norris Dunn and M. Sullivan, Rossland, but bonded to the R. E. Lee Gold Mining Company. President, Charles S Vorhees; Secretary, H. L. Wilson, Spokane. These claims were bonded by Mr. John M. Burke, but no work is being done at the present time. The principal work has been done near the centre of the dividing end line of the two claims; as on the R. E. Lee, there is a 30-foot tunnel with a 20-foot drift, in the floor of which can be seen 2 to 3 feet of mixed ore in a lead running east and west and dipping north 60°. About 50 feet west, but on the Maid of Erin, is the main shaft, 74 feet deep, with a level at 50 feet, running 47 east, and a cross-cut 24 feet north. As water filled these workings they could not be seen, but on the surface there were piled several tons of ore, consisting mostly of fine-grained mispickel, or arsenopyrite, the value of which was not ascertained; but Mr. Dunn reports that from 12 tons taken from the tunnel the net smelter return was $458 for the lot in gold. About 500 feet south of this lead a 30-foot shaft is sunk in a second vein of mispickel, 2 to 14 inches thick, said to assay well in gold, dip and strike the same.

Immediately west of this property is the *Gopher*, not working, from a 60-foot shaft in which has been taken considerable ore, similar to that of the R. E Lee, and which is thought to be on the same vein that runs into the next claim to the west, the Homestake To the south is the Mayflower, already described.

Homestake.

Area, 21.3 acres; title, Crown grant. Location, three-quarters of a mile south of Rossland. Under bond to the Homestake Gold Mining Company. President, S J. Johnson, Rossland. At the time of visit (July 9th) no work was being done, and the workings were full of water; but, however, at all of them there was piled up considerable ore, not high grade, or iron pyrites and marcasite, or "white iron," with some copper pyrites and zinc blende, with calcite and quartz in the diorite. This vein can be traced for nearly 700 feet through the claim by cuts, strike east and west, dip 70° north. A tunnel runs in a considerable distance, but not on the lead, while at the mouth is a small shaft said to be all in ore, in some of which piled on top is galena. A short distance east are two shafts, 75 feet apart and con-

nected by a drift, one being 90 feet deep, in which workings was ore, of which about 100 tons were on the dump, 50 or 60 feet from the tramway. The proper and thorough opening up of this promising property only awaits the settlement of the bond and sufficient capital for adequate work.

North of this claim is the *Freeburn* claim, Crown grant applied for, on which a 25-foot shaft, near the tramway, starts down on a narrow crevice, strike nearly east and west, which, near the bottom, widens to a few inches of ore, similar to that found in the Homestake.

West of this claim, and south of Rossland townsite, is the *Nest Egg* mining claim; title, Crown grant; owned by the Nest Egg Gold Mining Company, of Victoria. On this property there appear to be two leads in which the ore is now pyrrhotite and copper pyrites, similar to most of the ore now shipped. Near the discovery post is a shaft now filled with water, but showing at the top more or less sulphides scattered through the diorite, of which 2 or 3 tons were piled on the dump. About 100 feet south is the second lead, strike about south-west and north-east, dip northerly, on which is an open cut for 20 feet and then a shaft filled with water, with mixed ore near the top, and several tons on the dump. West of this opening is a second a shaft 30 feet deep now being sunk, at the top of which is 1½ to 2 feet of ore, which improves in depth, several tons of good looking ore being piled up, or pyrrhotite and copper pyrites, fine grained, and impregnated with quartz.

The *Phœnix*, title, Crown grant, owned by the Phœnix Gold Mining Co., General Manager, Mr. J. K. Clark, has a 30-foot shaft now being sunk 50 feet more, in which is ore similar to that found on the Nest Egg, or mixed sulphides and diorite.

North of the Homestake, and west of the Mayflower, are the *Blue Bird* and *Curlew*. The Blue Bird, agent, Ed. Bosquet, Rossland, is believed to be the extension of the Mayflower vein, and in a shaft 22 feet deep, on 2 to 3 feet of mixed ore, of which about ten tons are on the dump, a fine grained iron pyrites and mispickel, blende and galena. Further surface prospecting is now being done. On the Curlew, owned by John Earle and Jos. Vogel, is a 43-foot shaft in which is a vein of 6 to 10 inches of ore similar to that of the Blue Bird, which has given assays of $6 to $10 in gold and 70 to 80 oz. silver. When water leaves the shaft, or soon, work in the shaft will be continued.

One-half mile west of these claims, along the Dewdney trail, considerable work is now in progress, and that on the Zilor, Lily May and Deer Park, may be mentioned. The *Zilor*, owned by W. Perdue and W. J. McKay, but bonded by E. Morrison, of Victoria, has 3 shafts full of water, the one at the east end being in barren diorite, while on a 20-foot shaft is considerable ore on the dump, similar to the Lily May ore. Further west is a 60-foot shaft that started down in a good body of ore, but passed into barren rock, although ore is reported to be in the bottom.

Lily May.

Area, 13.87 acres. Title, Crown grant. Location, 1¼ miles south of Rossland on the Dewdney trail. Owners, Lily May Gold Mining Co., of Spokane, Wash. Pres., George Turner; Sec.-Treas., Frank Kizer, Spokane; Superintendent, Frank Watson, Rossland. Capital stock, $1,000,000 in $1 shares. This is the oldest claim in this camp, having been located in 1889 by Jos. Bourgouis, but recorded in 1890 by Oliver Bordan. In a very fine grained rock, probably a diorite, the iron-capped outcrop was traced for some distance and a tunnel started on a vein running N. W. by S. E., dip, N. E. 50° to 60°, following ore that assayed in silver, gold and lead, silver being predominant, for nearly 40 feet. Since this the tunnel has been advanced to 85 feet, with some mineral all the way, when it connects with an incline from the surface, 37 feet above, in which the ore petered out, but in a foot widened out again to 3 or 4 feet of solid sulphides, consisting of white iron or marcasite and iron pyrites with zinc blende. A winze is being sunk now at this point, that at 12 feet passed into barren rock to again expose at 52 feet ore 3 to 18 inches wide (July 10th), consisting of quartz gangue and pyrites that yields on assay a good value in gold and silver, although it must yet be rated as low grade ore. To the south two small shafts point to the existence of a second lead on this property, which is being carefully prospected, while ore encountered in development work is being sorted and stacked. A road ½ mile long, and of an easy grade, can be made to the tramway when enough ore of good grade can be mined. Mr. Watson, while actively pushing the working of this property, has begun the prospecting of the Black Horse claim to the west. Number of men employed, 12.

Deer Park.

Area, 52 acres. Title, Crown grant. Location, on east side of Deer Park Mountain, 1¼ miles S. W. of Rossland. Owned by the Deer Park Gold Mining Co. Pres. L. W. Mulholland;

Sec., R. L. Rutter, Spokane. Capital stock, 1,000,000 shares of $1 each. Gen. Manager, E. J. Kelley, Rossland. On this property is one of the largest bodies of sulphides in this district, in which a shaft 60 feet deep and 47 feet of cross-cut are altogether in this very low grade massive pyrrhotite. In the bottom of the shaft the ore was showing some change in that some chalcopyrite and quartz were coming in, which may lead to improvement in the grade of the ore, and to a shute of pay ore.

In the valley south-west of the town work is being done on several claims, such as the Commander, Palo Alto and San Joaquin, Butte, Florence, Alameda and Tramway.

Commander.

Area, 52 acres. Title, Crown grant applied for. Location, 1¼ miles S. E. of Rossland on the road to Trail. Owners, the Commander Mining and Smelting Co., Spokane. General Manager, W. J. Harris; Secy.-Treas., Frank Watson, Rossland. Capital stock, $1,000,000 at $1 each. After considerable work had been done on the surface by trenching, a shaft, 5 by 9 feet, was begun on an outcrop of mineralized rock east of a porphyry dyke that runs nearly north and south. It follows down on a smooth wall for some distance, several tons of ore being taken out in sinking. At the bottom (73 feet July 10th) the diorite carries more or less copper pyrites, and assays in gold from $4 to $13 per ton. There is a 20-H.P. boiler, a good gallows frame, and a small sinking pump that was not working very well, thus retarding more rapid sinking, although not much water was coming in. On reaching a depth of 100 feet, drifts will be run east and west to explore the ground, and ore can be shipped by waggon to Trail, or to the tramway, about ⅓ of a mile distant. Foreman, J. Houghton. Number of men, 12.

Palo Alto and San Joaquin.

Area, each claim is of full size; title, Crown grant. The Palo Alto is owned by the Palo Alto Gold Mining Company, Spokane, P. A. O'Farrell, President and the San Joaquin by the San Joaquin Gold Mining Company, Limited, of Victoria. Trustee, Hon. D. W. Higgins. Through these properties, all east and west, a vein has been traced for some distance; that near the separating end-line is crossed by the porphyry dyke, to the west of which, on the Palo Alto, is a 31-foot shaft, down which for 17 feet was oxidized matter, and after that to the bottom up to a width of 3 feet of ore, or fine grained arseno-pyrite. One hundred feet west of this is an open cut, on six feet of ledge matter, in which not enough depth has been attained to reach unaltered ore. East of the dyke on the San Joaquin, a shaft is being sunk on a narrow crevice, and at a depth of about 18 feet the diorite has become much more mineralized with pyrrhotite and copper pyrites. The Palo Alto is not being worked, but the San Joaquin shaft will be continued.

Cost of Mining.

The cost of labour and mine supplies is now about the same as found in other mining centres of the west. The following is the cost of labour—Miners, $3 to $3.50 per 8 and 10 hour shifts; trammers and top-men, $2.50 per 10 hours; engineers, $3.50 to $4 per 10 hours; timbermen and blacksmiths, $3.50 to $4 per 10 hours; foremen, $4 to $5 per day. The cost of driving tunnels or drifts depends much upon the nature of the rock; in exceptional places, where the ground is much broken, the cost is from $7 to $10 per foot; but in the solid, tough diorite, from $10.50 to $15.50 per foot. Shaft sinking depends upon the size to some extent, but costs from $18 to $30 a foot. The price for timber, lumber, wood and other supplies, is now very reasonable.

I have the honour to be, Sir,

Your obedient servant,

William A. Carlyle,

Provincial Mineralogist.

August 8th, 1896.

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